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THE RESOURCES AGENCY
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LIGHT-FOOTED CLAPPER RAIL CENSUS AND STUDY, 1988 1/

by

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ABSTRACT

The ninth consecutive annual census of the endangered Light-footed Clapper Rail (Rallus longirostris levipes) revealed 177 pairs of Clapper Rails in 14 marshes in Southern California. One hundred and sixteen pairs, or 65.5% of the state total, were detected at Upper Newport Bay. All of the small subpopulations face serious problems that should be dealt with through increased management and the provision of additional habitat or they will be lost. High tide counts were continued on the Seal Beach National Wildlife Refuge and the counts are tabulated for 1975 through 1988. Ten and 6 Clapper Rails, respectively, were sighted during two winter counts in 1988. Call counts in Baja California, Mexico revealed a minimum of 75 Clapper Rail territories in El Estero and 119 in San Quintin.

Nine trapping sessions at Upper Newport Bay with 12 - 16 drop-door traps and 349 trap-hours resulted in the capture and unique color-banding of 6 more Clapper Rails. There were 18 resightings of 6 banded rails. Maximum distances between points of detection for these 6 rails varied from 20 to 165m and averaged 81m. The longest time span between banding and a resighting of a rail for the 93 banded since March 1981 has been 5 years. The longest banded of the 6 Clapper Rails resighted in 1988 was a rail banded in 1984.

Observations were made at two nests in Upper Newport Bay through a video camera for 52.7 hours over 11 days. Incubation duties were shared by pair members. The time between exchanges of incubation duty varied from 55 to 195 minutes and averaged 93.7 minutes at nest 1 (n = 13) and varied from 58 to 250 minutes with an average of 128.3 minutes at nest 2 (n = 4). Common activities of the incubating rails included egg turning, invertebrate gleaning, and repositioning of nest material. Hatching was observed at nest 2. Both adults fed the young and

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appeared to regurgitate some of the food for the chicks. Broken egg shells were eaten by both adults, as were droppings of the chicks. The calls used at the nests were mostly very soft.

The domestic cat has been added to the list of highly probable predators on Clapper Rails. Bands of Common Crows (Corvus brachyrhynchos) were observed foraging in the low-growing vegetation in the marsh; they were numerous and meticulous and probably missed few nesting birds in the zone they searched. Strong evidence of a Mallard (Anas platyrhynchos) takeover of a Clapper Rail nest was obtained. Predation, particularly by red foxes, was high at Anaheim Bay and only 3 of 15 clutches of Clapper Rail eggs may have hatched on the nesting platforms there.

Twenty-four Clapper Rail nests were found on the 46 nest rafts made available in the Seal Beach NWR. Thirteen of the nests held 15 clutches of eggs but recruitment was probably very poor due to high predation. The nesting rafts deployed at three other marshes were not used by Clapper Rails.

Three more papers on various aspects of the life history of the Clapper Rail have been accepted for publication in the scientific literature. The work leading to these publications was partially supported by the California Department of Fish and Game.

FINAL REPORT TO

CALIFORNIA DEPARTMENT OF FISH AND GAME

CONTRACT FG 7609 (FY 1987 - 1988)

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LIGHT-FOOTED CLAPPER RAIL CENSUS AND STUDY, 1988

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INTRODUCTION

The 1988 investigations included a census of the California population of Light-footed Clapper Rails (Rallus longirostris levipes) in the spring of 1988; censusing of the Light-footed Clapper Rails in Baja California, Mexico; winter high tide counts; trapping, banding, and observations at Upper Newport Bay, Orange County, California; video monitoring of active nests at Upper Newport Bay; the placement and monitoring of artificial nesting platforms at the Seal Beach National Wildlife Refuge in Anaheim Bay and collaboration in trials with platforms at three other marshes; continued analysis of our data for publication; and other activities.

This report is organized into subsections describing the different aspects of our endeavors, within each of which can be found methods, results, discussion, and recommendations, where appropriate.

California Population

The ninth consecutive annual census was conducted 7 March - 3 April 1988. Thirty-one coastal wetlands were censused by mapping spontaneous calling or soliciting calls with playbacks of clappering (Zembal and Massey 1985a). Clapper Rails were detected in 14 of the marshes (Table 1). The state total was nearly the same as in 1987; no meaningful recovery has occurred since the population crash in 1985. Consequently, this endangered bird is still in trouble in the United States.

Only a single marsh, that of the State Ecological Reserve at Upper Newport Bay, has a large thriving population. The 116 pairs detected at Upper Newport Bay represented 65.5% of the state total.

The total for the Tijuana National Wildlife Refuge was lower this year, compared to last year, and again there were several advertising females present in the marsh. This gives reason for major concern over the reproductive viability of this subpopulation. The presence of kek-burring females appears to be extremely disruptive of successful reproduction by dividing the attention of the males (Zembal and Massey 1985b). Although paired males will copulate with adjacent, unpaired advertising females, the efforts needed to hatch eggs and raise young appear to be too great for a female without a full-time mate. If the male's attentions remain divided, there is little chance that either female will raise young. There is some reason to believe that the resurgence of Clapper Rails in the Tijuana Marsh was the result of the reproductive efforts of a limited number of individuals that survived the prolonged inlet closure in 1985 by subsisting nearby in marginal habitat. The presence of so many advertising females may be related to the small number of rails responsible for todays subpopulation. Could this involve sibling recognition? Regardless of the actual cause, it may take a long time and the movement of new rails into the marsh before the skewed sex ratio, whether actual or behaviorally induced, finally stabilizes.

Although the subpopulation at Anaheim Bay grew to 14 pairs by the spring of 1988, there were also 6 advertising females present.

Census of the Light-footed Clapper Rail In California, 1980 - 1988

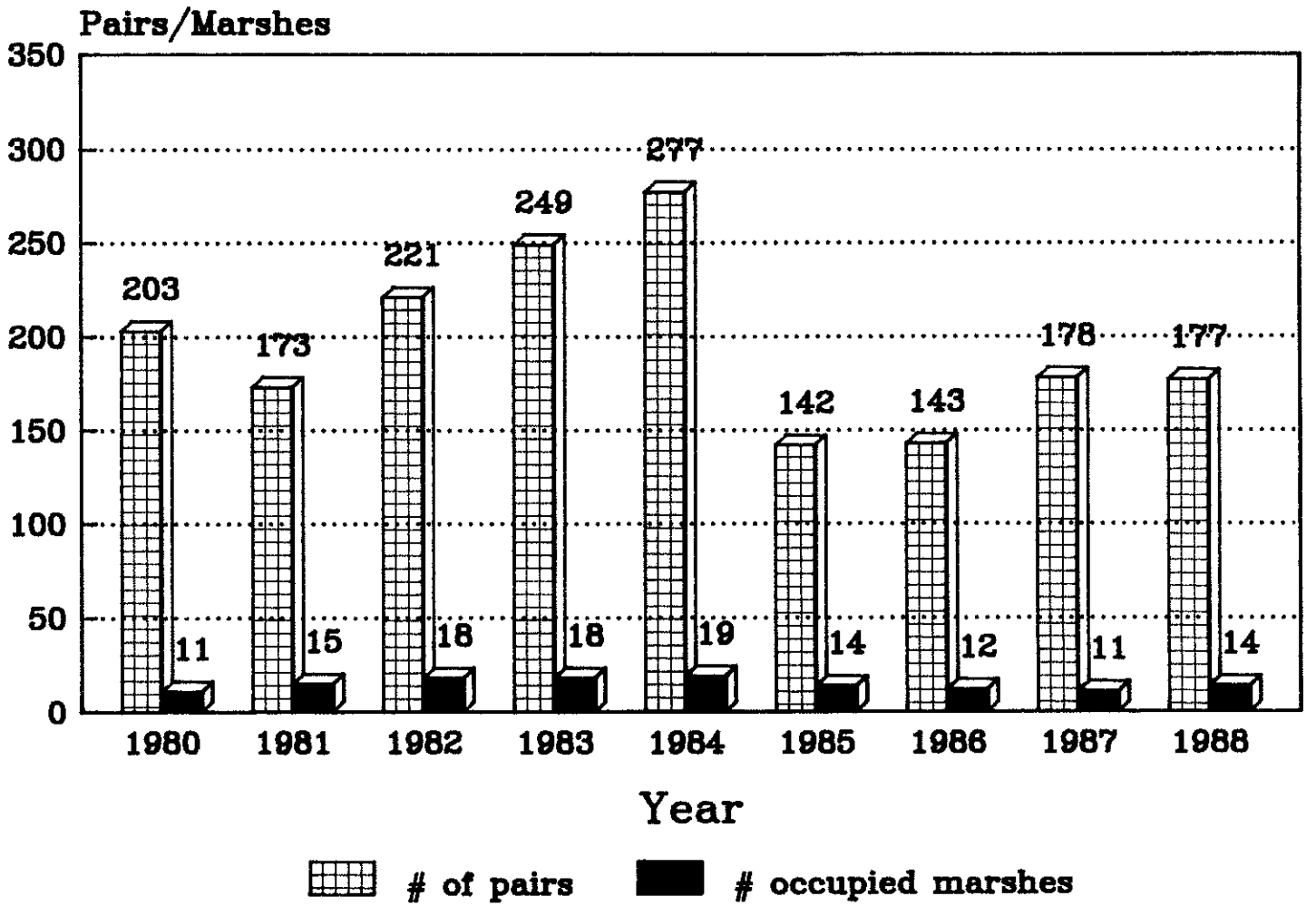

Table 1. Census of the Light-footed Clapper Rail in California, 1980 - 1988.

Location	Number of Pairs Detected In:								
	1980	1981	1982	1983	1984	1985	1986	1987	1988
Santa Barbara County									
Goleta Slough	0	0	–[a]	0	–	–	–	–	0[#]
Carpinteria Marsh	16	14	20	18	26	7	4	5[#]	2[#]
Ventura County									
Ventura River Mouth	–	–	0	0	–	–	–	–	–
Santa Clara River Mouth	–	–	0	–	–	–	–	–	–
Mugu Lagoon	–	0	–	1	3	7	6	7[#]	7[#]
Los Angeles County									
Whittier Narrows Marsh	–	–	–	*[b]	0	–	–	–	–
Orange County									
Seal Beach NWR	30	19	28	20	24	11	5	7	14
Bolsa Chica	0	0	0	0	–	–	–	*	0
Huntington Beach Strand	–	0	–	–	–	–	0	0	0
Upper Newport Bay	98	66	103	112	112	87	99	119	116
San Joaquin Reserve	–	–	5	4	1	2	1	0[#]	0
San Joaquin-Carlson Rd Marsh	–	–	5	4	2	0	0	1[#]	0
San Diego County									
San Mateo Creek Mouth	–	–	0	0	–	–	0	–	0
Las Pulgas Canyon Mouth	–	–	0	0	0	–	–	–	–
Las Flores Marsh	–	–	0	0	0	–	0	–	0
French Canyon Mouth	–	–	–	0	0	–	–	–	–
Cocklebur Canyon Mouth	–	–	1	0	0	–	–	0	0
Santa Margarita Lagoon	0	0	2	1	2	1	1	1	1
San Luis Rey River Mouth	–	–	0	0	–	–	0	0	0
Guajome Lake Marsh	–	–	0	1	2	0	0	0	0
Buena Vista Lagoon	0	0	0	*	0	–	–	–	0
Agua Hedionda Lagoon	1	2	1	7	6	1	0	0	0
Batiquitos Lagoon	0	0	0	0	0	–	–	–	–[#]
San Elijo Lagoon	–	5[c]	4	4	10	1	0	2	5[#]
San Dieguito Lagoon	–	–	–	–	–	–	–	*	0
Los Penasquitos Lagoon	–	0	–	0	0	–	0	–	1[c#]
Kendall-Frost Reserve	18	16	6	20	24	17	12	6[c#]	4[c#]
San Diego River F. C. C.	–	3	1	2	2	1	0	0	1[c#]
Paradise Creek Marsh	1	2	3	1	1	0	0	0	0
Sweetwater Marsh	4	5	7	6	14	3	9	5[c#]	5[#]
E Street Marsh	3	1	3	3	2	2	2	0[c]	1[#]
F Street Marsh	–	1	1	0	1	0	0	0	0
J Street Marsh	–	1	0	0	–	–	0	0	0
Otay River Mouth	3	4	5	3	5	1	1	0[#]	0
South Bay Marine Reserve	3	3	1	1	2	1	1[c]	2[#]	5
Dairy Mart Ponds	–	–	–	–	–	–	0	*	1[c]
Tijuana Marsh NWR	26	31	25	41	38	0	2	23[c#]	14[c#]
TOTALS: number of pairs	203	173	221	249	277	142	143	178	177
number of marshes	11	15	18	18	19	14	12	11	14

[a]The dash (–) means that no census was taken.
[b]The star (*) indicates that at least one rail was detected in winter or fall but presence during the breeding season could not be confirmed.
[c]Data are from Paul Jorgensen's field notes.
[#]One or more of the reported points were probably not pairs - see text. This notation was not used prior to 1987.

This may be associated with the major inimical factor there, very high predation pressure, perhaps exclusively by red foxes. The foxes appear to be more interested in eating Clapper Rail eggs than adults, but some adults are apparently being killed as well. Two dead rails were found adjacent to predated nests this past season, for example (see below under Nesting Platforms). The males may be more susceptible to predation because of bolder nest defense or the female-skewed sex ratio may somehow again be associated with the small number of Clapper Rails present. Recruitment was very poor this year in Anaheim Bay due to the untoward predation, complicated by the presence of too many females. It will not be certain how many rails survived the onslaught until the spring of 1989, but the outlook for Clapper Rails in the Seal Beach National Wildlife Refuge is extremely dismal. Although 14 pairs was a good estimate in the spring of 1988, it is certainly an excessively optimistic representation of this subpopulation's size and viability today.

Seven others of the remaining 11 occupied marshes also appeared to have skewed sex ratios, as follows. The 2 points of calling detected at Carpinteria Marsh were both advertising males, as indicated by their prolonged keking (see Massey and Zembal 1987, Zembal and Massey 1987). Without the influx of females, this subpopulation is reproductively dead. The 7 points at Mugu Lagoon included 1 advertising male. The 5 points noted for San Elijo Lagoon was an attempt to reasonably represent the number of rails detected but it overstates the reproductive viability of this subpopulation. There were actually 10 points of calling, only 1 of which was from a mated pair; the other 9 points were from incessant kekers. Eight of the 10 points of calling were detected well above the lagoon wetlands along Escondido Creek in the dense cattail (Typha spp.) beds there. The single point at Los Penasquitos Lagoon was actually 2 advertising females. In addition to the 4 pairs at the Kendall-Frost Reserve, there were 2 advertising males. The 1 point noted for the San Diego River Flood Control Channel was an apparently unmated female and the single at the E Street Marsh was an unpaired male. The long-term viability of all of these subpopulations is questionable.

In the hope of discovering an overlooked refugium for Clapper Rails near Carpinteria, several previously uncensused wetlands to the north were also examined. None of them currently holds much potential habitat for Clapper Rails and no responses to the tape were heard. The two largest of these newly examined wetlands, Carefoot Slough and the mouth of the Santa Ynez River, have good size and some promise but too much water.

The more hopeful signs from the smaller subpopulations were at Sweetwater Marsh and the South Bay Marine Reserve. There was good evidence of 5 pairs in each marsh. This must be near saturation for the little Reserve Marsh and may explain what happened to some of the rails from the Otay River mouth. The Sweetwater Marsh should soon be subject to much better management under the U. S. Fish and Wildlife Service. Hopefully, we are about to witness a resurgence of this subpopulation. If it does not come quickly and is not manifest without a skewed sex ratio, additional Clapper Rails should be translocated from Upper Newport Bay once Sweetwater is secure under protective management.

Nine consecutive years of censusing Light-footed Clapper Rails in California has led to a view of an endangered species in great trouble. All of the smaller subpopulations may be in imminent peril of disappearing. In a relatively large marsh, like Upper Newport Bay, with high productivity for Clapper Rails, periodic calamities have been recovered from in the past. With ample productive marsh acreage, the wetland eventually recovers from episodic catastrophes like heavy winters that bring destruction of lower marsh nesting sites and dramatic fluctuations in populations of food organisms due to heavy fresh water influx. Because there were enough rails present at Upper Newport Bay, that subpopulation has quickly recovered to repopulate the entire marsh at least twice in the recent past. With too few rails and too little marsh acreage or ample acreage that is not productive enough, most of the smaller subpopulations have faltered over time or disappeared. Even with ample acreage, the small subpopulations may not harbor the genetic diversity to handle episodic disasters, even the natural ones. Between the springs of 1984 and 1985, the 5 largest subpopulations in the state, those at Carpinteria Marsh, the Seal Beach NWR, Upper Newport Bay, Kendall-Frost Reserve, and the Tijuana Marsh NWR all suffered heavy losses. Only Upper Newport Bay has fully recovered. The 53 ha of Carpinteria Marsh and 26 pairs of Clapper Rails did not provide enough of a cushion for recovery from whatever the calamity was that struck there; that subpopulation is reproductively dead. The 24 pairs of rails and 226 ha of habitat at the Seal Beach NWR were not enough to cushion the combined effects of too little nesting habitat and too many red foxes, etc.

A few years ago we were much more complacent. We thought Carpinteria Marsh was just fine in its security for Clapper Rails. Over the much longer term, we may find out we were wrong about Upper Newport Bay too. What disasters could befall Upper Newport Bay several years in succession and what might the results be? Calamities that could strike at Upper Newport Bay might not be felt as severely in another portion of the range. In terms of the continued long-term survival of the Light-footed Clapper Rail in the United States, we are taking an unjustifiable chance if we do not work hard now toward increased wetland acreage, increased productivity, and at least one additional large population center of Light-footed Clapper Rails in California.

There are difficulties in facilitating this at any of the major coastal wetlands of southern California. Attempting something in the least expensive way, by moving rails around, should only be accomplished when the birds can be moved into an adequately secure situation. If it appears reasonable beyond most doubt, for example, that the sedimentation problems confronting the Tijuana Estuary will not result in inlet reclosure, then we should consider moving males from Upper Newport Bay into the marsh. If the 1989 census again reveals an abundance of females, the suitability of this marsh for receipt of Clapper Rails from Upper Newport Bay during the following winter should be examined.

The more expensive alternatives for increasing Clapper Rail numbers involve habitat restoration. Some of these would not be very expensive. The fresh water marsh that was inadvertently

drained at the inland edge of the inner lagoon at Agua Hedionda should be restored. The water management scheme for the inner portion of San Elijo Lagoon should be altered to provide better habitat for Clapper Rails; there is a much higher potential there than what is now being manifest and the expansion of a small existing subpopulation could be facilitated. The Department of Fish and Game should also be vigilant to ensure that any coastal wetland restoration project implemented within the range of the Light-footed Clapper Rail includes design measures to provide habitat, particularly nesting sites, for this endangered bird. Such measures can be quite minor and only add to the overall value of a restoration project. Lastly, the organizations that maintain and may one day rebuild Pacific Coast Highway and the railroad trestles constricting the mouths of San Elijo and Los Penasquitos Lagoons should be kept aware of the need for much greater spans over those inlets. Although costly, restoration of good tidal flushing to either of these wetlands, particularly at Los Penasquitos, would result in dramatic increases in productivity for a wealth of species, including Clapper Rails.

High Tide Counts

There have been counts of Clapper Rails during extreme high tides at the Seal Beach National Wildlife Refuge nearly each winter since 1975 (Table 2). The counts involve stationing enough observers around the perimeter of the flooded marsh to sight all of the rails that are forced from cover by an extremely high tide. In many other marshes, these counts are not worth doing because too much cover remains even during the highest tides to hide most of the birds. The counts are not consistent, even at Anaheim Bay, but the positive data are useful. There has been considerable variation in the total birds observed, even during comparable tides with equivalent visibility and coverage on consecutive days; note the 1977 and 1979 counts, for example. Reciprocally, the higher counts are most useful. We documented heavy losses during the rough winter of 1980-1981, for example, with the second highest early winter count of 55 Clapper Rails, dropping to 38 by the 1981 spring call count.

Although the counts may be lacking in consistent precision, they have added important information to our understanding of both behavior and trends. For example, an observation by Dr. Charles T. Collins of a uniquely color-banded rail in December 1982, definitively documented that individuals of this normally sedentary race will sometimes move between marshes (Zembal et al 1985). With another count during the winter of November 1984, came ample reason for concern for the rails in Anaheim Bay; fewer rails were counted than red foxes. This was one of our first concrete warnings of a difficult problem. The breeding population was cut by more than half between the 1984 and 1985 call counts, and again between 1985 and 1986. It only began to rise weakly after intensive efforts to control red foxes and the provision of artificial nesting sites.

The high tide counts are not the ultimate tool for studying Clapper Rails but they have resulted in important observations and should be continued at Anaheim Bay.

Table 2. High tide counts compared to call counts at Anaheim Bay, 1975 - 1988.

Date	Tidal Height	Clapper Rails Counted	Call Count [1]	% Diff.	Notes [2]	
2 Dec 1975	7.0	22	-	-		
31 Dec 1975	6.7	12	-	-		
21 Nov 1976	7.1	24	-	-		
20 Dec 1976	7.1	35	-	-		
21 Dec 1976	7.0	34	-	-		
10 Dec 1977	7.1	16	-	-		
11 Dec 1977	7.1	40	-	-		
18 Jun 1978	6.8	16	42	38.0%	(1979)	+6 youngsters
30 Nov 1978	6.7	38	42	90.5%		
1 Dec 1978	6.7	32	42	76.2%		
3 Sep 1979	6.4	20	42	47.6%		Tide too low
3 Nov 1979	6.6	56	60	93.3%	(1980)	
2 Dec 1979	6.7	32	60	53.3%		
3 Dec 1979	6.7	44	60	73.3%		
21 Nov 1980	6.9	55	38	144.7%	(1981)	
29 Jun 1981	7.0	34	38	89.5%		
12 Nov 1981	6.9	43	56	76.8%	(1982)	
29 Dec 1982	7.0	23	40	57.5%	(1983)	
18 Jan 1984	6.9	23	48	47.9%	(1984)	
21 Nov 1984	6.7	5	22	22.7%	(1985)	+ 7 red foxes
13 Nov 1985	7.1	2	10	20.0%	(1986)	+ 2 red foxes
12 Dec 1985	7.2	2	10	20.0%		+ 2 red foxes
30 Dec 1986	7.2	7	14	50.0%	(1987)	
28 Jan 1987	7.0	7	14	50.0%		
8 Aug 1987	7.3	8	14	57.1%		Tide too late
22 Nov 1987	6.7	12	28	42.9%	(1988)	
21 Dec 1987	7.0	8	28	28.6%		+ 2 red foxes
16 Feb 1988	6.8	10	28	35.7%		
22 Nov 1988	6.9	6	28	21.4%		

[1] The call count given is the number of rails documented in the early spring of the year given in parentheses under notes. The call count closest in time to the high tide count is the one compared.

[2] The notes, other than the call count year in parentheses, give additional observations made during the high tide count.

Mexico Census

Ten censusers (4 participated only part of the time) traveled to Baja California and counted rails on 19 and 24 March 1988 at El Estero, Ensanada and 20, 21, 22 and 23 March 1988 at San Quintin. Slightly different portions of the marshes were covered, making comparisons with past counts difficult. There were 75 points of calling detected at El Estero and 119 points in San Quintin. A full account of the Mexico trip is included as a separate report at the back of this report.

Banding and Movements

There were 9 trapping sessions, 17 September - 30 October 1988, for a total of 349 trap-hours with 12 - 16 drop-door traps. The traps are wire mesh boxes with two doors and a treadle in the center. They were set in tidal creeks and along other trails used by the rails (see Zembal and Massey 1983, for a full discussion of trapping and banding techniques). Trapping was confined, as usual, to Shellmaker Island and the small marsh parcel adjacent to the terminus of San Joaquin Hills Road. The trapping is still routinely done during the 2 - 4 hours before dark on evenings with appropriately low tides.

Six unbanded Clapper Rails were captured and uniquely color-banded, bringing the total banded since 1981 to 93 Clapper Rails. Trapping success was poor for the second consecutive year, with a yield of only 0.67 new captures per session, compared to 0.75 for 1987, 1.8 for 1986 and 1.07 new captures per session, 1981 - 1987 for 81 sessions. Similarly, there were 58.2 trap-hours per new capture in 1988, compared to 42.9 trap-hours per new capture in 1987, 15.4 in 1986 and 31.4 for 1981 - 1987. Four of 9 sessions in 1988 yielded no Clapper Rail captures.

The trapping done in 1987 and 1988 may simply have been done too late in the season for high success. High capture rates have been attained in the past when large numbers of relatively careless juveniles are concentrated within family groups on Shellmaker Island. We were late this year to accommodate the activities planned by personnel of the California Research Station of the Fish and Wildlife Service. Earlier trapping would have resulted in trap-wary rails, so we postponed trapping and were going to trap and band in conjunction with the Research Station's telemetry study. That study was postponed due to other priorities.

Most of the Clapper Rails we have banded appeared to become very trap-shy, once captured. Of the 93 Clapper Rails trapped since 1981, only 10, or 10.8%, were ever recaptured in drop-door traps. Seven of these recaptures occurred during the same year as the original capture, 1 - 6 months later. The other 3 recaptures occurred 1 - 2 years after banding. Five of the recaptures that occurred just a few months after original captures were in 1986, our year of highest trapping success thus far.

Trapping is very labor-intensive and we grew quite weary of the low success we were having. This led to experimentation in 1988 with camouflaging the traps. Direct observations of several rails during trapping sessions led to the conclusion that some individuals were avoiding marsh parcels that had traps set in them. There were

5 different observations of rails moving casually into creek mouths that had traps set in them a few meters back. In each case, the bird came scurrying out of the creek seconds later and quickly traversed 50 - 150 m of mudflat before re-entering the vegetation. After the fourth trapping session, the last 2 of which were fruitless, we sewed camouflage covers for the traps. Rails were only captured in uncovered traps during several subsequent trapping sessions and the covers were discarded.

There were 18 resightings of 6 banded Clapper Rails in 1988, with attempted sightings concentrated on 26 dates from May 19 to October 30, for 2 - 6 hours per date or approximately 100 hours. This does not include repeated observations of two banded rails on their nest (see below). Distances between points of detection varied from 20 to 165m and averaged 81m. None of the moves was significantly long since the rails observed all had remained resident near their original banding sites. The longest moves detected were by rail no. 481 merely traversing its territory. Banded at the southeast extent of the mudflat along Shellmaker Island, rail no. 481 took up residence opposite Acacia Point. Its moves and activities were centered about the hummock on the west side of the mudflat to the pond and creek on the east side; the mudflat here is about 30m across.

Another banded rail, no. 468, was found dead. It was banded in 1986 and discovered this year, badly decomposed and next to a predated nest in pickleweed (Salicornia virginica) about 80m from where it was banded.

There were 16 sessions of observation at Upper Newport Bay in September and October, resulting in 51 sightings of Clapper Rails that included adequately long looks at legs to check for bands. Most of the rails we see move in and out of cover so quickly that their legs are not seen well without repeated attempts. Legs that are in view long enough to determine the band code are commonly too muddy to decipher the entire code. In addition, ambient light is often very low during the peak times of rail activity, in the early morning and late evening. Consequently, it is much easier to tell if a rail is banded than to identify the bird individually. Of the 51 pairs of legs that were checked, 43 or 84.3% of the birds were unbanded.

When we first began the banding program, we were not much concerned about low capture rates because we were certain that several of the banded rails would be around for many years. Now we know this not to be the case; the turnover in Upper Newport Bay is much higher than what we expected. Of 93 Clapper Rails banded since 22 March 1981, we could only account for 6 in 1988. We certainly may have missed a few birds on Shellmaker Island but strongly doubt that there are many banded rails elsewhere in the bay. Although the opportunities for observing banded rails are generally poorer away from Shellmaker Island, we have spent ample time looking and been mostly unsuccessful.

Banded first-year rails have been roamers. They have no choice since they are eventually chased out of their natal home ranges. Consequently, about half of the banded rails may have been first-year birds that simply moved off of Shellmaker to take up their first territories elsewhere in the Bay. However, there appears to be a strong tendency to take up residence near natal

territories, if there is room and to remain, once established. The tendency to remain in one area, once established, has been demonstrated by several banded Clapper Rails that were resighted occasionally over the years (Zembal and Massey 1986). It also does not seem as likely that a rail that has disappeared has moved to a new area after several years in the same territory, as it does that it has probably met its demise. There is ample evidence of heavy predation pressure at Upper Newport Bay (Zembal and Massey 1986). However, we have documented movements by males to adjacent territories associated with mate loss (Zembal and Massey 1985). Reciprocally, the female involved stayed in the same territory with three different mates, at least one of which was killed before she solicited a new mate.

If the same factors that force banded rails to leave Shellmaker Island operate consistently throughout the bay, then it is probable that very few roamers survive and few banded rails exist elsewhere in the bay. The habitat for Clapper Rails within the bay is at least as good away from, as on, Shellmaker Island. Consequently, reproductive success is probably just as high and general availability of territories just as low elsewhere, as on the island. Perhaps the only factor changed significantly for a rail moving far from its natal home range is the greater chance of being predated upon by being forced into the open repeatedly during encounters with established rails while constantly traveling through unfamiliar areas. Of 13 telemetered rails, for example, 6 were roamers and half of the roamers were predated during the short periods they were followed by telemetry. In contrast, none of the 7 established and sedentary rails was predated during telemetry.

Four of the rails resighted in 1988 were banded in 1986; only one was banded earlier, in 1984. The longest span between the banding date and the date last observed for any Clapper Rail thus far was for rail no. 406; the bird was banded in 1981 and last seen in 1986, only 5 years later. This has led to a view of the Light-footed Clapper Rail as a relatively short-lived organism whose numbers are maintained through high reproductive rates.

Nesting Behavior

Nest searches were conducted on Shellmaker Island, the marsh parcel north of San Joaquin Hills Road (the shellmound marsh), and on Upper Island in Upper Newport Bay to locate nests that could be followed closely with a video camera. There were nest searches on 9 dates, 19 May - 8 July 1988, for 1 - 5 hours per search.

The first nest discovered was in freshwater reeds, next to the road on the north side of the San Joaquin Hills Road marsh. The 7 eggs it contained were predated by the next day. A second nest, discovered on the same day, had been predated 1 - 2 weeks earlier and a dead Clapper Rail, rail no. 468, was found nearby in an advanced state of decay. Finally, about 150 m from the road edge, an active nest with 7 eggs was discovered along a small creek in cordgrass (Spartina foliosa) on Upper Island. The Upper Island nest was discovered on 10 June and followed to near the hatching date, on or one day before 21 June, and for one day after hatching on 22 June 1988. The video camera was in place

with an observer or two for a total of 31 hours on 8 different dates.

Since we actually missed the hatch during a series of high tides, I searched out another active nest; this one was on the south side of the shellmound marsh in freshwater reeds. This second nest was discovered on 6 July 1988 with 6 eggs, 1 of which had been cracked slightly from the outside. The nest was visited daily from then through chick dispersal, on or before 12 July 1988. The video camera was in place, along with 1 - 3 observers from 9 July through 11 July 1988 for a total of 21.7 hours.

In addition to the work at Newport, we had positioned 5 of the nesting platforms within 10 - 20m of Nasa Island in the Seal Beach NWR. We had hoped to be able to follow a nest there from the edge of the island. One of the platforms was used by Clapper Rails but was predated by red foxes shortly after a full clutch of eggs was laid (see below).

The video camera was housed in a protective wooden box with a glass front. The glass was covered with brown paper (to reduce the surface area that would reflect a rails image, see Zembal and Massey 1988) except for an opening large enough to allow a full view through the camera lens. The camera was operated on the ground, 2 - 3m from nest 1 (the Upper Island nest) and was on a tripod about 3 - 4m away and focused down on nest 2. The monitor screen, batteries, and observers were located 10 - 15m away from the nests. We filled 2 full video tapes with samplings of the action described below.

Incubation was shared by both members of a pair and was constant except for brief disturbances caused by placing and removing the camera. The incubating rails took 0 - 50 minutes, and an average of 13.7 minutes, to return to the nest after we caused them to leave. The time between the exchanges of incubation duty at nest 1 varied from 55 to 195 minutes and averaged 93.7 minutes. The 13 exchanges observed were preceded by light purring (in 7 cases), high pitched gurgling (3), or rarely by burring (1) or in combination with clucking (1) or clappering (2); the exchange was silent once. Only 4 incubation exchanges were documented on the day of hatching at nest 2. The stints of incubation duty varied from 58 to 250 minutes and averaged 128.3 minutes. The exchanges were with chicks present and were silent except once when accomplished with squealing or high pitched gurgling. Both parents actually attended the nest most of the day in varying capacities (see below).

Nest 1 was monitored from about the middle of the incubation period to almost the end. We discontinued monitoring on 19 June, falsely believing that hatching was still about a week away. Brief examination of the nest 2 days later revealed the presence of at least one chick. The camera was cautiously reset the next day, chicks and an adult were seen briefly, but after 2.5 hours of waiting, it did not appear that they would return to the nest with the camera in place and we left. Our disturbance at the nests does not appear to affect the birds excessively but with such mobile young, there is no real reason for them to tolerate our presence. Exchanges at nest 1 were more vocal than at nest 2 where chicks were present. Most of the communication was with soft calls; clappering was uncommon, for example. The activities

of the incubating rails on nest 1 were mostly position readjustment, egg turning, invertebrate gleaning from the nest rim, and repositioning of nest material. The calls heard included clucks or low knocks, clicking, squealing, gurgling, purring, growling, burring, keking, and clappering. Calling was brief and the louder calls were uncommonly used. In 81 minutes between exchanges, one incubating rail adjusted its position 8 times; the other changed position 8 times in 98 minutes. Eggs were sometimes just slightly repositioned, or they were actively turned with the bill or feet from one to three times per incubation stint. One to several nabs at invertebrates occurred during a typical bout of incubation, with occasional adjustments of nest material.

Most of the coverage of nest 2 was on the day of hatching, 10 July 1988. At least one egg was starred on 8 July and 3 of 6 were starred on 9 July 1988. Both pair members at this nest were banded. The female was rail no. 469 who was banded near this nest site in 1986 and shared a territory with rail no. 480 in 1987 located about 150m to the south of the 1988 nest site. Rail no. 469's mate at the 1988 nest was a 1984-banded bird that had lost the colored tape on its metal band.

Hatching was in progress at nest 2 by 0725 hrs, when the camera was positioned. High pitched squealing or gurgling and clicking by the adults, along with peeping by the chicks, were the common soft sounds heard all day. The brooding rail fed the chicks invertebrates from the nest rim and food items brought by the other adult. The female brooded for 422 min (65% of the total time) on the hatching day, compared to 227 min (35%) for the male. Both rails appeared to regurgitate food for the chicks, particularly earlier in the day. Up until about 1020 hrs, the female gleaned invertebrates occasionally, turned the eggs regularly, and slept off and on. Shortly after 0800 hrs, she was also observed eating eggshells; this happened again several times through the morning and both adults engaged. The big pieces of the empty eggs were broken up and large chunks were consumed. There was no evidence of any shell being removed from the nest; it appeared as if it all was eaten.

Up until about 1020 hrs, no feeding of chicks was observed. At about this time, the female captured an insect from the nest rim and held it in the tip of her bill. A chick pecked at her bill and she appeared to regurgitate and feed the chick (s) (two chicks were probably present by then). Feeding visits became frequent by the nonbrooding adult, by the female at first and at 1330 hrs, by the male. Isopods were identifiable as part of the foods brought. The food-supplying adult passed some of the food directly to chicks, often kneading the item with the bill first, while some of the food was passed to the brooding adult and then to the chicks. The adults appeared to be regurgitating food for the chicks, as well. Between noon and 1233 hrs, the female made 11 visits to the nest with food. Between 1233 and 1331, the male made at least 4 feeding visits to the nest. (Many of the food passes may have been out of view to the side and partly hidden by the brooding bird). At 1331 hrs, the male began the brooding again and the female returned at least 25 times with food, until the final exchange of brooding duty at 1615 hrs. The male then

brought in food at least 22 times between 1630 and 1814 hrs. The female cleaned the nest during her last observed stint of brooding and swallowed everything she handled, including what appeared to be fecal sacs.

The rails were off and about on the day after hatching and would not return to the nest, at least while the camera was in place. Two eggs were left unhatched in the nest, one of which was the one with the hairline crack.

Predation

The Red-tailed Hawk (Buteo jamaicensis) remains the only predator ever observed actually killing a Light-footed Clapper Rail. However, indirect evidence implicates several other predators (Zembal and Massey 1986). Although the Great Horned Owl (Bubo virginianus) is suspected of being primarily responsible for the Clapper Rail remains found under the low perches on Shellmaker Island, a Red-tailed Hawk was observed on one of these perches this year, for the first time since 1986. There was only one check of these perches in 1988; the remains of at least 4 Clapper Rails were found under them in October.

A freshly killed Clapper Rail was found being guarded over by a domestic cat along Backbay Drive in Upper Newport Bay (Greg Gerstenberg, pers. comm.). The bird was still warm and so it is most probable that the cat was responsible for its death. Domestic cats come down from the homes on the bluff top to hunt the marsh and one may have been responsible for rail no. 468's death, as well.

Seven eggs disappeared from the nest on the north edge of the shellmound marsh, without any disruption of the nest or shell remains. This may have been predation by a snake. In attempting to check the south nest (video nest 2) on the day after its discovery, I (RZ) observed a 4ft. gopher snake (Pituophis melanoleucus) 1m from the nest and incubating rail. I assumed that the rail could handle the situation if I left it alone but that if I flushed the bird, the eggs would be vulnerable. Consequently, I backed slowly out, the rail stayed on the nest, and this nest made it through hatching.

During the video taping of the nest on Upper Island, we observed bands of Common Crows (Corvus brachyrhynchos) foraging meticulously through the marsh. They were there every late afternoon, numbered 40 - 90 or more individuals, and combed the marsh methodically where low grasses and succulents were dominant. As thorough as the searches appeared by that many crows, it is difficult to envision how a late Belding's Savannah Sparrow (Passerculus sandwichensis beldingi) nest or berm nest of a Clapper Rail could possibly escape detection and egg predation.

More evidence of predation by red foxes on Clapper Rail nests was obtained this season at Anaheim Bay. Two of the nest rafts were probably hit by young foxes and obvious signs were left. Both tumbleweeds (see Nesting Rafts, below) had been burrowed out and about a third of their volumes and both nests had been scraped off the sides of the rafts. There were tufts of fox fur left on the broken twigs and a splat of fox droppings adorned a corner of one of the rafts. At 7 other rafts, the

evidence was less dramatic but still conclusive; the two ravaged rafts demonstrated the subtler signs to be looked for. There were twigs broken inward about the openings to the nests, fur on some of the twigs, chewed support cord, and fox tracks. Most of the eggs laid never got close to hatching and the predation probably included the killing of adult Clapper Rails, as well. Two dead adults were found near two different predated egg nests on rafts.

Better indirect evidence of duck takeover of a Clapper Rail nest was also obtained. A Mallard (Anas platyrhynchos) was flushed off of a nest on raft 17 on 7 July 1988. She was incubating 6 duck eggs and 1 Clapper Rail egg. There was one additional duck nest on a raft. Both of the duck nests were predated.

Nesting Rafts

The 28 rafts placed in Anaheim Bay in 1987 were still floating well in 1988. They were refurbished by replacing damaged dowels and by placing dense tumbleweeds on each. An additional 18 rafts were built with the same specifications as used last year (Zembal and Massey 1988) and they too were placed in the marsh. Of the total of 46 rafts available to Clapper Rails in 1988, 43 were ready by 1 March and the final 3 were installed on 10 March 1988. The rafts were examined about once every three weeks. There was a total of 11 raft checks, 20 March - 29 August 1988.

The first egg nest on a raft was already in evidence during the first check. By the last examination, 24 rafts had held nests and 13 of these held 15 clutches of eggs (Figure 1). Three of the clutches of eggs may have hatched successfully; all of the rest were predated (Table 3).

The 1988 nesting season was a disaster for Clapper Rails in Anaheim Bay. Red foxes caught onto the rafts and plundered most, if not all of the nests with eggs. The Animal Damage Control was called in and did an exemplary job of removing many red foxes but not before the rails were basically denied use of the rafts. At least two adults lost their lives, as well, probably in defense of egg nests or young. The worst part of the problem is that it is conceivable that all of this damage could have been caused by one to a few problem animals that happened to key in on the rafts.

Rafts were also deployed by contractors of the U. S. Fish and Wildlife Service at Carpinteria Marsh (15 rafts), Point Mugu (25 rafts), and Kendall-Frost Reserve (15 rafts). We collaborated with the contractors along the way and helped organize the effort and deploy the rafts at the two northern marshes. None of the rafts were used by rails and we discovered very little about the problems for Clapper Rails in the three marshes.

With only 2 males in Carpinteria Marsh during the 1988 breeding season, it is not surprising that no use of the rafts was recorded. Dogs, cats, and raccoons (Procyon lotor) in the marsh may hint of the kinds of troubles that led to the Clapper Rails' demise there. At Point Mugu, about half the rafts are in

locations that are so poorly tidally influenced, they probably seldom floated. There would be little incentive for the rails to use these or perhaps any of the rafts upcoast of Laguna Road where the tides are quite muted. Poor tidal inundation and related predation are probably the rails greatest problems at Point Mugu but this does not fully explain the lack of use of the downcoast, better tidally influenced portion of the marsh.

The rafts at Kendall-Frost were used as frequent perches by an immature Red-tailed Hawk, a formidable deterrent to Clapper Rail use. The feathers of a Clapper Rail were under one of the rafts as if it had been plucked on the raft (Melinda Pruett-Jones pers. comm.).

We have certainly not found a range-wide panacea for the Light-footed Clapper Rail in the nesting rafts, but we should keep trying at selected places, particularly at the Seal Beach NWR.

I proposed to the U. S. Navy to use circular life preservers to float tumbleweeds to augment the installed rafts in 1989. If a cheap source of the rings can be found, many such rafts could be installed. Perhaps dramatically increasing the number of rafts available, while encouraging Animal Damage Control's activities, will allow the Clapper Rails to breed and recover in the Seal Beach NWR.

Publications

The investigations of Light-footed Clapper Rails, partially supported by the California Department of Fish and Game, have led to many publications in the scientific literature. Included below are the latest three.

Eddleman, W. R., F. L. Knopf, B. Meanley, F. A. Reid, and R. Zembal. 1988. Conservation of North American Rallids. Wilson Bull. 100(3): 458-475.

Zembal, R., and J. M. Fancher. 1988. Foraging behavior and foods of the Light-footed Clapper Rail. Condor 90(4): 959-962.

Zembal, R., B. W. Massey, and J. M. Fancher. In Press. Movements and activity patterns of the Light-footed Clapper Rail. J. Wildl. Manag. 53(1): 39-42. [Proofs were read and returned on 14 November 1988.]

Presentations

Aspects of the life history of the Light-footed Clapper Rail and efforts being made to recover this endangered species along with the appropriate acknowledgment of the Department were presented during separate speaking engagements to: The Amigos de Bolsa Chica; Orange County Natural History Association, symposium held at the University of California, Irvine campus; Audubon Society's Western Region Coordination Council Meeting; San Fernando Valley Chapter of the Audubon Society; Faculty, staff, and students at the California State University, Long Beach

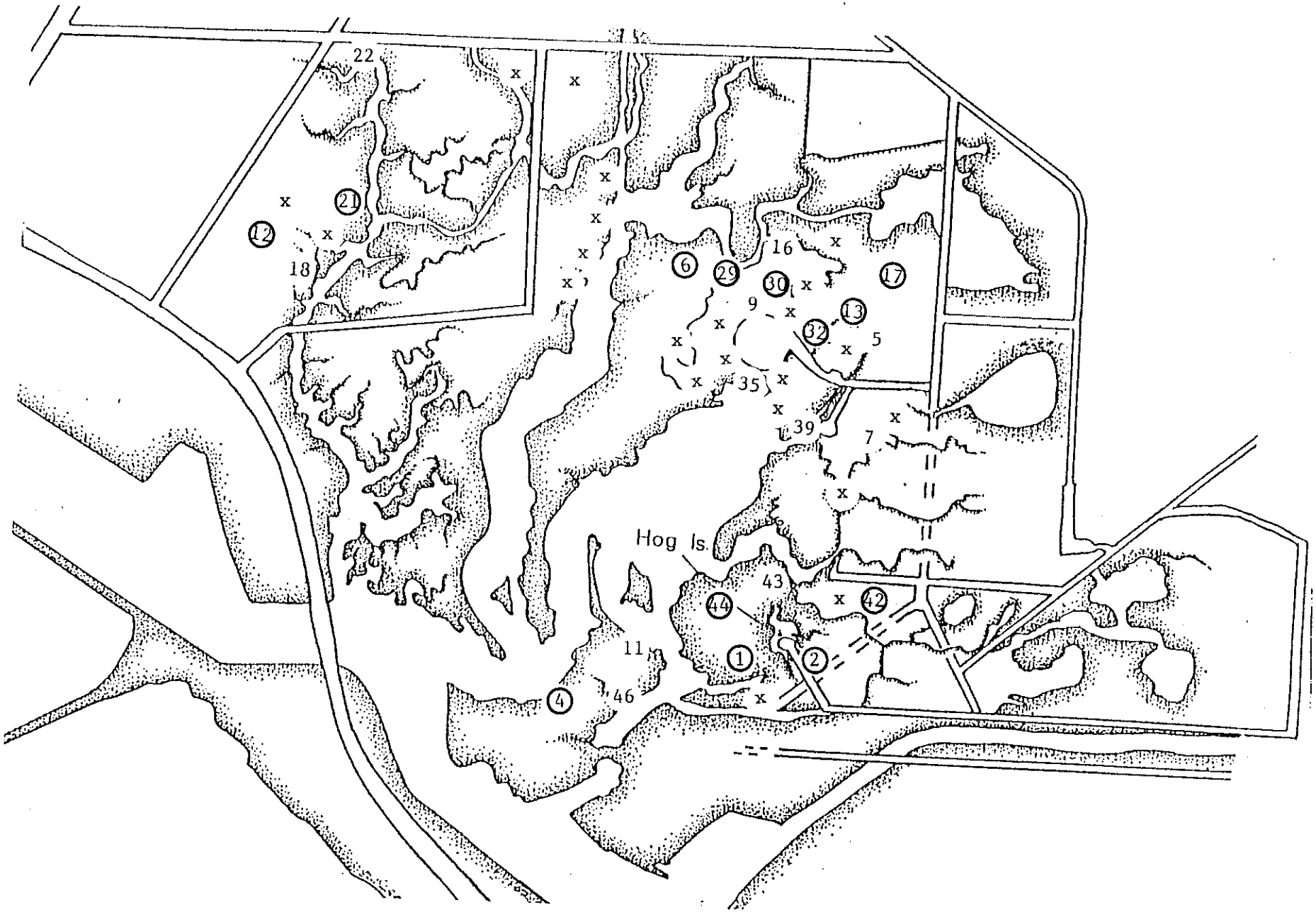

Figure 1. Locations of 46 nesting platforms in the Seal Beach National Wildlife Refuge, 1988. Rafts that are numbered held Clapper Rail nests; nest sites that are circled held eggs.

Table 3. Nesting raft use by Clapper Rails in the Seal Beach NWR, 1988

Raft # [2]	Nest	Dates of Detection [1] Egg/Incubation [3]	Outcome [4]
1	4-9	4-9	H? 4-29
2	4-9	4-9 (7-7)	P 4-29 (P 7-7)
4	4-9	4-9	P? 4-29
5	4-11	-	-
6	4-11	4-11	H 4-29
7	4-9	-	-
9	6-13	-	-
11	3-21	-	-
12	3-20	3-20 (4-9)	P? 3-20 (H? 4-29)
13	4-11	5-21	P 5-21
16	4-11	-	-
17	4-29	7-7	P 7-7 (Duck Nest 7-7, P 7-26)
18	4-18	-	-
21	4-29	5-21	P 5-21 (Duck Nest 6-13, P 7-7)
22	5-21	-	-
29	5-21	5-21	P 5-27 (Dead Rail Too)
30	4-11	6-13	P 6-13 (Dead Rail Too)
32	5-21	5-21	P 5-27
35	4-29	-	-
39	4-29	-	-
42	4-29	4-29	P 4-29
43	5-21	-	-
44	4-9	4-29	P 4-29
46	3-21	-	-

[1] Dates for 2 renests are in parentheses, along with notes under outcome.

[2] The rafts were numbered in the order of nest discovery in 1987, then the numbers were filled in so that all rafts were numbered in 1988.

[3] Care was taken not to flush incubating rails. The scant data on clutch size that were collected are not provided here.

[4] H = Successful hatching; P = Predated; ? = Uncertain.

campus, Biology Department's seminar series; Ecology class at Golden West College; and South Coast Chapter of the Audubon Society.

Acknowledgments

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Census of the Light-footed Clapper Rail in Baja California, Mexico

19 - 25 March 1988

report written by Barbara W. Massey

Participants:

Full time - Barbara Massey, Ray Bransfield, Karla Kramer, Heather Hollis, Michael Evans, Lynn Overtree.

Part-time (2 days in San Quintin) - Kathy Keane, Victor Lopez, Abby White, C.J. White.

The first census of Light-footed Clapper Rails in Ensenada and San Quintin was done in the spring of 1981; since then 3 annual counts have been taken - 1986, 87 & 88. Since 1986 the counts have been with the approval of CICESE, the federal biological research institute in Ensenada, and our reports have been sent to Dr. Silvia Ibarra-Obando at CICESE.

There was a wide discrepancy between the 1986 and 1987 counts in terms of numbers of rails, presumably because there was a 6 week difference in the time of year at which they were taken. In 1986 the trip was not until the last week in April (30 April - 2 May), by which time the peak vocalization period was over (Zembal & Massey 1987). In 1987 the census was done from 18 - 23 March, at the height of the vocalizing period, and this year's census was conducted at the same time of year (19 - 25 March) and in approximately the same manner. Ideally, counts should be done in the evening, listening to spontaneous vocalizations and not using tapes (Zembal & Massey 1981). The marshes in Baja California are large enough for this procedure to work well, but the number of marshes that can be censused is limited by time and personnel. In past years we have used tapes in the early morning in order to census more marshes, but results have not been consistent. It appears preferable to do fewer counts and standardize them from year to year, so that results can be compared.

METHODS

Censusers were stationed along the marsh about 1/2 hr before sunset, and evening vocalizations were plotted on maps as the birds called at dusk. Four calls were recognized: a pair clappering, a single bird clappering, a kek call (usually repeated monotonously), and the kek-burr call. We have interpreted the clappering calls as pairs; the repeated kek is the call of an unmated male; the kek-burr is the call of the female either advertising for a mate or summoning her

mate (Massey & Zembal 1987). Any of these calls is considered a point of vocalization, and is considered a potential pair even if it is an unmated bird calling. Tapes were not used to elicit calls.

At El Estero the area censused this year was somewhat different from 1987. The area covered was from the main east-west channel to a large channel north of Tony's Camp (Fig.1). We did not venture south of the main channel; last year it proved too difficult and dangerous to return from there to camp after dark. Instead we censused the marsh at La Grulla (Fig. 1) which had to be skipped in 1987.

At San Quintin, an extra day was scheduled to enable us to census one more marsh than in 1987. Unfortunately we did not have enough people to accomplish this, and had to make a choice between evening counts at either the Graveyard Marsh or Bahia Falsa Marsh (Fig.2); both marshes were censused in 1986/87 by eliciting responses to tapes in the morning. We chose to do the latter, as 38 pairs had been heard at dusk in 1981, and daytime responses to tapes in '86 and 87 were poor (Table 1).

The 6 full-time participants left San Diego Saturday morning,19 March. That evening we censused a section of the marsh on the east side of El Estero (Fig.1). Next day we drove to San Quintin and censused the East-peninsular marsh (Fig.2). On 21 March the other 4 censusers joined us and we counted the North Marsh that night and the Dump Marsh the following night. On 23 March we were back to 6 participants for the count at Bahia Falsa Marsh. The following day, 24 March, we returned to El Estero and censused the west side marshes and the horseshoe-shaped marsh at La Grulla.

The weather during the week was ideal for vocal censusing. Temperatures were mild and there was little wind at Ensenada; San Quintin was, except for the first evening, chill with strong winds during the day; but the wind died after dark.

RESULTS

Table 1 shows the results of censusing at both bays. Counts from previous years are shown also, but the totals cannot be used for comparison, as the methods of counting and areas counted were not all standardized. Counts of comparable areas taken by evening census are shown in Table 2; these figures can be compared for yearly variation.

El Estero, Ensenada

On 19 March the section of the east side marsh shown in Fig.1 was censused; two people were stationed north of Tony's Camp, the other 4 between Tony's Camp and the large channel. The evening was warm and still, conditions were excellent for censusing. North of Tony's Camp there were frequent rounds of clappering by 20 pairs, beginning just before dusk. South of there fewer birds were heard, but most were clappering pairs.

There were 7 kekers, but no kek-burrs. Total: 45 points of vocalization - 35 clappering pairs, 3 single clappering rails, 7 kekers. The count was in the same range as 1987, when 54 pairs were heard.

On 3/24 we returned from San Quintin and censused the west side marshes and La Grulla (Fig.1). Although the uplands on the spit surrounding the hotel had been totally denuded of vegatation since last year (see CONSERVATION ISSUES), there were still Clapper Rails in the northernmost pocket marshes, where responses have been elicited by tape on every previous visit. In the evening, the two marshes on the spit just north of the Bose-Pacific project and the one at La Grulla were censused (Fig.1). On the spit 11 points of vocalization were recorded (including two in response to the tape in the afternoon); most calls were clappers (9 clappering pairs, 2 kekers). At La Grulla there were 19 points; 10 of the calls were kek-burrs, repeated frequently and suggesting unmated females (4 clappering pairs, 1 single clapper, 4 kekers, 10 kek-burrs). The counts in 1988 were in the same range as in 1981 (13 points of vocalization) the only other time this marsh was counted. At that time, according to our field notes, there were many kek-burr calls also.

The total number of vocalizations at El Estero was 75 (48 pairs, 4 single clappers, 13 kekers, 10 kek-burrs). However, this figure cannot be compared to 1987 because the areas covered were not comparable. When the same areas are compared (Fig. 3) the counts have not varied much from 1986 to 1988 (Table 2).

Bahia de San Quintin

On 20 March we drove to San Quintin and censused the East Peninsular Marsh in the evening (Fig.2). There were 6 censusers. It was an extremely mild, still evening and sound traveled well. We heard 45 calls: 15 clappering pairs, 6 single birds clappering, and 24 keking males. The count was lower than in 1987 when 54 pairs were heard, and there were many more kekers (see DISCUSSION).

The following night we were joined by 4 more censusers, so the complement was 10 people for two evenings. We counted the Northern Marsh that night and heard 22 calls; only 3 were clappering pairs, the other 19 were kekers. This was very different from the 1987 count, when 52 vocalizations were heard (Table 1), and all but one was a clapper call.

On 22 March we counted the Dump Marsh, and again the count was down from 1987. Thirty one calls were heard in an area where 44 were heard in 1987 (the section adjacent to the dump was not covered this year). Again, kekers predominated (2 clappering pairs, 2 single clapperers, 27 kekers), where last year there was only one.

On 23 March, down again to 6 censusers, we counted the Bahia Falsa Marsh. Twenty one calls were heard: 9 pairs, 12 kekers. This marsh had not been censused at dusk since 1981, when 38 pairs were heard.

Counts of comparable areas done in the same way are seen in Table 2; all counts were lower than in 1987. The predominant vocalization was keking; 82/119 calls (69%) were kekers as compared to 22/194 (11%) in 1987.

DISCUSSION

There were several notable differences in results at El Estero and San Quintin in 1988. Vocalizing was strong at El Estero, far less vigorous in San Quintin. At El Estero clappering was the predominant call; at San Quintin there were many more keking males than pairs at all marshes.

By late March pairs should be well established and nesting about to begin, and the evening round of vocalizations should be predominantly clappering pairs, as was the case at El Estero. We know from research in California that the pair bond is maintained from year to year if both members survive; and one does not hear a steadily keking male on a territory unless he is advertising for a mate. The implication at San Quintin is that there is a dearth of females this year, that there may have been a selective die-off of females during the winter. Before reaching this conclusion, it would be advisable, but unfortunately not practical, to repeat the count.

A year-to-year comparison showed that comparable areas at El Estero had comparable counts, but at San Quntin the numbers were down in 1988 at three of the 4 marshes counted.

There are no aerial photographs of these marshes, and thus no way of determining the size of the habitat. Thus we cannot know how many rails there are per hectare to compare with a California marsh. Such information would be very useful, because the Baja marshes are in near-pristine condition and could be used as a standard when looking at restoration plans for U.S. marshes. Even with the population fluctuations was have noted in annual counts, there is no doubt that both marshes host a large population of rails, and serve as a reservoir for this beleaguered species.

CONSERVATION ISSUES

On arrival in Ensenada we met with scientists from CICECE, Dr. Silvia Ibarra-Obando and Anamaria Escofet, to discuss marsh projects of mutual interest. Both are doing research in El Estero. We exchanged reports with them and were told that the Bose-Pacific project on the west side of El Estero has fallen on hard times, and the 2nd phase, although approved, will probably not be carried out. However, a resort complex under construction on the barrier beach comprised of a hotel and vacation homes (Fig. 3) has resulted in destruction of the dunes over approximately a square mile on the sandspit. <u>All</u> vegetation has been removed and the dunes graded flat. There is now fine white sand to the marsh

edge, and nothing to hold the sand agains strong winds or major storm tides. An earthern dike has been built out into the water perpendicular to the spit in preparation for a marina. The resort company plans to dredge a channel from the mouth to its proposed marina, deep enough to allow access for large yachts. There is also the question of the hotel's grey water; there will be a serious pollution problem if it is allowed to drain into the bay.

At San Quintin, according to Dr. Ibarra, there is a plan to build a large hotel on the sandspit, and a smaller hotel and restaurant on the shore in Bahia Falsa. While the latter could perhaps be constructed without major damage to the bay, the former could be catastrophic. The sandspit is near-pristine, there is a 4-wheel drive track along the first mile, then nothing. Construction of a large hotel would necessitate roads, electricity, a fresh water source, and waste disposal. Damage to the barrier beach could alter the hydrodynamics of the bay and its marshes and pollution could be expected to be a major problem. Serious negative impacts on Clapper Rails would probably result from these changes. The major deterrent to this plan, according to Dr. Ibarra, is the threat it poses to the thriving aquaculture project in Bahia Falsa which produces oysters, scallops, and abalone.

As a result of these findings, a meeting was called in San Diego on 20 May, which was attended by 35 interested Mexican and U.S. scientists and conservationists. A bi-national group was formed, co-chaired by Silvia Ibarra and Barbara Massey, with the long-range goal of protecting the marshes of Baja California. The most immediate task is to try to prevent the dredging of a marina in Estero de Punta Banda. We hope this group will enable Mexican and U.S. biologists to work together effectively in the best interests of the Baja marshes. The future of the Light-footed Clapper Rail and California Least Tern would be even more precarious without the pristine wetlands south of the U.S. border that now act as a reservoir for these endangered species.

RECOMMENDATIONS

Close monitoring of Light-footed Clapper Rail populations at El Estero and San Quintin should continue annually. There are plans for development at El Estero that would have dire consequences for the marsh. Less imminent but equally drastic threats face Bahia de San Quintin. It is important to keep records on the normal fluctuations in the population, so that the effects of diking, dredging and other proposed changes can be monitored if they occur.

Accurate topographic maps are not available for either estuary, and thus not data are available on the number of pairs/ha. Aerial photographs should be taken and maps drawn from them.

A cooperative program between Mexican and U.S. researchers and conservationists should be established to deal with threats to the Baja marshes, and other management problems involving endangered species.

LITERATURE CITED

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Fig. 1. 1988 census of Light-footed Clapper Rails at El Estero, Ensenada, 3/19/88 & 3/24/88. Total: 75 points of vocalization.

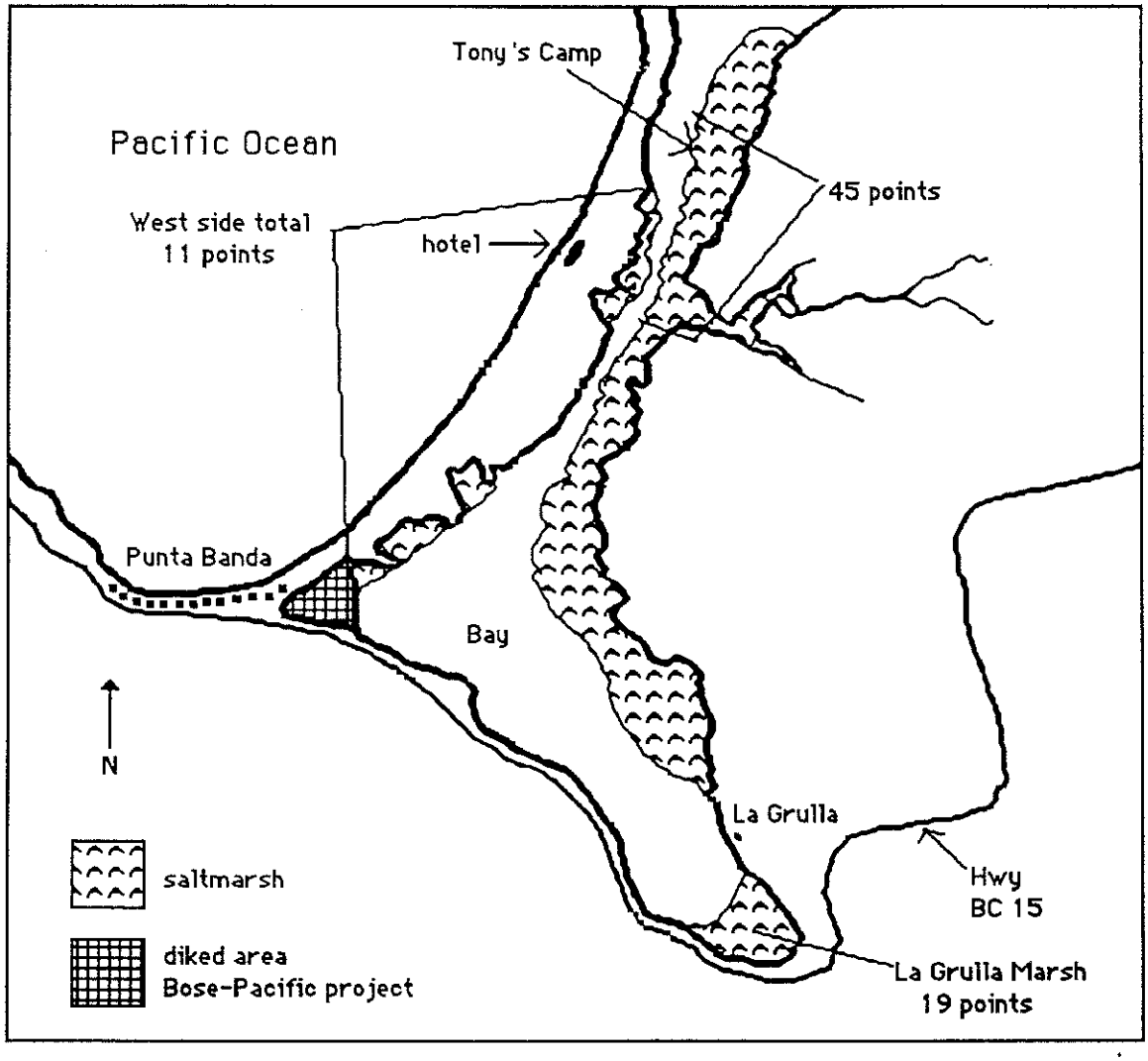

Fig. 2. 1988 census of Light-footed Clapper Rails in Bahia de San Quintin, 3/20/88 - 3/23/88. Total: 119 points of vocalization.

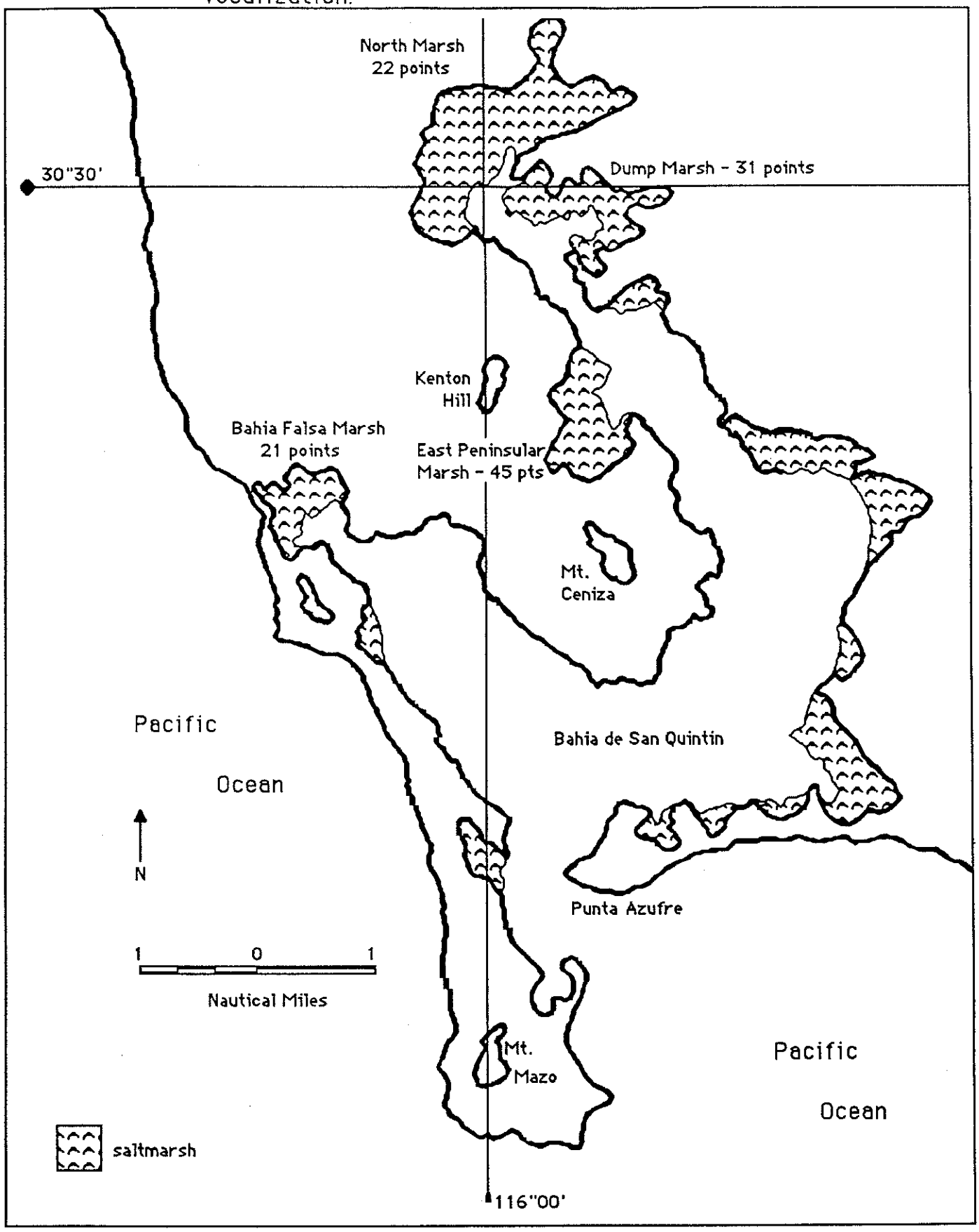

Fig. 3. El Estero, Ensenada, with areas outlined that are used in Table 2 to show comparable counts in consecutive years.

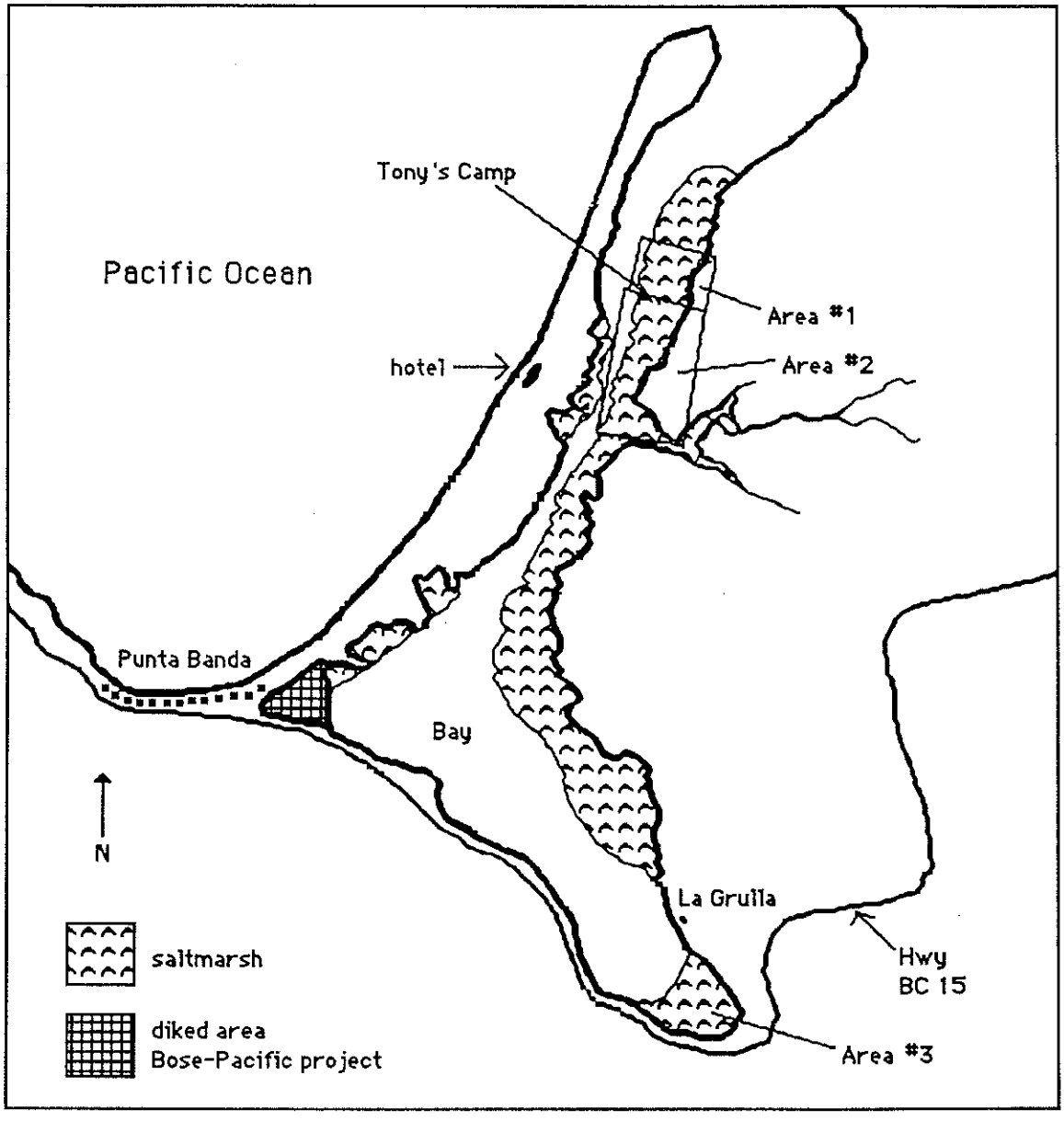

Table 1. Light-footed Clapper Rail counts at Ensenada and San Quintin in 1981, 1986, 1987, and 1988.

Site	1981	1986	1987	1988
EL ESTERO, ENSENADA				
East side [1]	68	44	118	45
West side	- [2]	7 [3]	9 [3]	11
La Grulla (south end)	-	13	-	19
	68	64	127	75
BAHIA de SAN QUINTIN				
Bahia Falsa Marsh	38	19 [3]	7 [3]	21
East Peninsular Marsh	37	48	54	45
North Marsh	32	35	52	22
Dump Marsh	-	48	53	31
El Molino Marsh	-	3	-	-
Graveyard Marsh	-	26	26	-
Totals	107	179	192	119

1 The area counted was not comparable from year to year; counts of comparable areas are shown in Table 2.

2 Not censused

3 Censused by tape in the AM.

Table 2. Counts of comparable areas of the marsh on the east side of Estero de Punta Banda.

	1986	1987	1988
Area #1 [1]	18	15	20
Area #2	21	29	25
Area #3	13	-	19

[1]See Fig. 3 for locations of areas 1-3.